

(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 913 508 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:  
12.05.1999 Bulletin 1999/19

(51) Int Cl. 6: D01F 9/127, G01B 7/34

(43) Date of publication A2:  
06.05.1999 Bulletin 1999/18

(21) Application number: 98308872.5

(22) Date of filing: 29.10.1998

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(30) Priority: 30.10.1997 JP 298373/97  
14.09.1998 JP 276426/98

(71) Applicant: CANON KABUSHIKI KAISHA  
Tokyo (JP)

(72) Inventors:  
• Den, Tohru  
Ohta-ku, Tokyo (JP)  
• Iwasaki, Tatsuya  
Ohta-ku, Tokyo (JP)

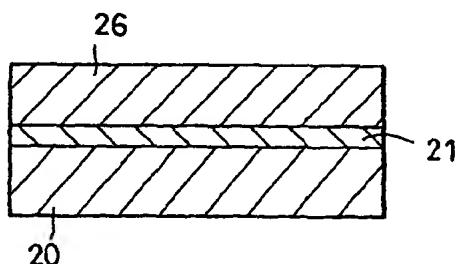
(74) Representative:  
Beresford, Keith Denis Lewis et al  
BERESFORD & Co.  
2-5 Warwick Court  
High Holborn  
London WC1R 5DJ (GB)

(54) Carbon nanotube device, manufacturing method of carbon nanotube device, and electron emitting device

(57) The present invention discloses a carbon nanotube device comprising a support having a conductive surface and one or more carbon nanotubes, one of whose terminus binds to the conductive surface so that conduction between the surface and the carbon nanotube is maintained, wherein a root of the carbon nano-

tube where the carbon nanotube binds to the conductive surface is surrounded by a wall. Such a carbon nanotube device, having carbon nanotubes with a uniform direction of growth, can generate a large quantity of emitted electrons when it is used as an electron emission device.

FIG. 8A



EP 0 913 508 A3

FIG. 8B

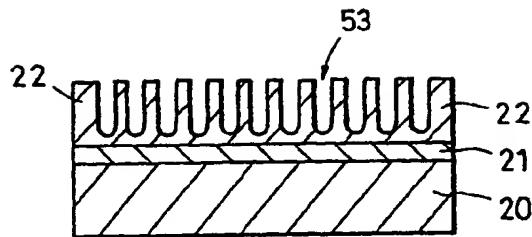


FIG. 8C

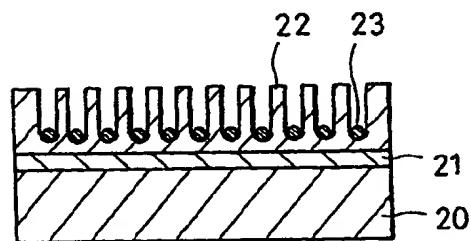
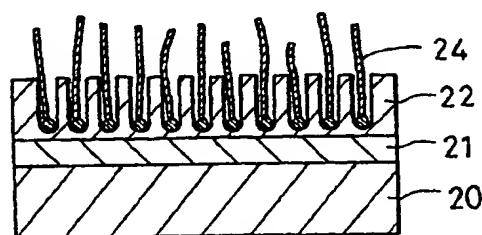


FIG. 8D





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 98 30 8872

DOCUMENTS CONSIDERED TO BE RELEVANT							
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)				
A	T. KYOTANI ET AL.: "Preparation of Ultrafine Carbon Tubes in Nanochannels of an Anodic Aluminum Oxide Film" CHEM. MATER., vol. 8, 1996, pages 2109-2113, XP000626894 * page 2109, right-hand column, line 1 - page 2113, right-hand column, line 34 *	1	D01F9/127 G01B7/34				
A	EP 0 758 028 A (RESEARCH DEVELOPMENT CORPORATION OF JAPAN) 12 February 1997 * page 3, line 14 - page 4, line 49; claims; figure 1 *	1					
A	WO 90 07023 A (HYPERION CATALYSIS INT.) 28 June 1990 * page 2, line 14 - page 3, line 19 * * page 4, line 31 - page 8, line 6; claims *	1					
P, A	WO 98 05920 A (WILLIAM MARSH RICE UNIVERSITY) 12 February 1998 * page 8, line 4 - page 9, line 25; figure 10 *	1	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">TECHNICAL FIELDS SEARCHED</td> <td style="width: 90%;">(Int.Cl.6)</td> </tr> <tr> <td colspan="2">D01F G01B C01B</td> </tr> </table>	TECHNICAL FIELDS SEARCHED	(Int.Cl.6)	D01F G01B C01B	
TECHNICAL FIELDS SEARCHED	(Int.Cl.6)						
D01F G01B C01B							
The present search report has been drawn up for all claims							
Place of search	Date of completion of the search	Examiner					
THE HAGUE	19 February 1999	Hellemans, W					
CATEGORY OF CITED DOCUMENTS							
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document							
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document							

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 98 30 8872

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
 The members are as contained in the European Patent Office EDP file on  
 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-02-1999

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 758028	A	12-02-1997	JP	9031757 A	04-02-1997
			JP	9228160 A	02-09-1997
			US	5863601 A	26-01-1999
WO 9007023	A	28-06-1990	AU	642401 B	21-10-1993
			AU	4947390 A	10-07-1990
			CA	2005642 A	16-06-1990
			EP	0451208 A	16-10-1991
			IL	92717 A	27-02-1994
			JP	4504445 T	06-08-1992
			KR	137224 B	28-04-1998
			US	5500200 A	19-03-1996
WO 9805920	A	12-02-1998	AU	4055297 A	25-02-1998

EPO FORM P0459  
For more details about this annex : see Official Journal of the European Patent Office, No. 12/82